

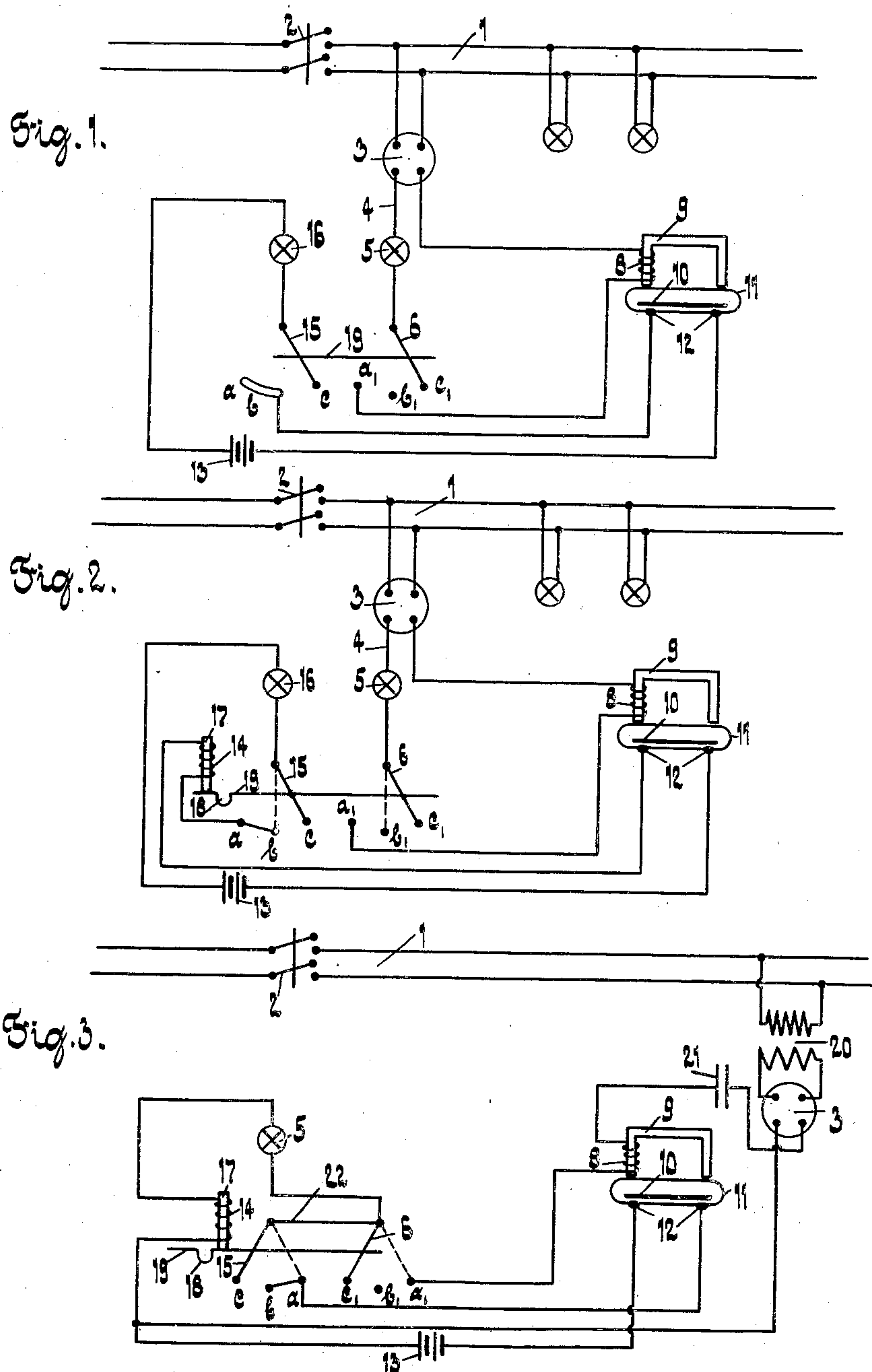
June 19, 1923.

1,459,283

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ELECTRIC EMERGENCY LIGHTING INSTALLATION

Filed Aug. 2, 1921



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## UNITED STATES PATENT OFFICE.

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ELECTRIC EMERGENCY-LIGHTING INSTALLATION.

Application filed August 2, 1921. Serial No. 489,212.

*To all whom it may concern:*

Be it known that I, PIETER DAS, subject of the Queen of Holland, residing at Delft, in the Province of South Holland, in the Kingdom of the Netherlands, have invented certain new and useful Improvements in and Relating to Electric Emergency-Lighting Installations, of which the following is a specification.

This invention relates to electric-light installations having a separate emergency-lighting, such as used in theatres, cinemas, railways, tram-cars, steamers, etc. In known installations of this class the current of a local battery or the like is supplied to the emergency lamp or lamps over one of the arms of a bipolar switch, the other arm of which is in circuit with one or more lamps used for ordinary lighting which will hereinafter be referred to as control lamps, an energizing coil of a relay and the working tension of the installation. The armature of the said relay is in its released position across two contacts belonging to the circuit of the emergency lighting. Consequently, when the bipolar switch is closed the control-lamps will light up, the relay attracts its armature thus breaking the circuit for the emergency lamps, which remain dark. When for some reason the tension in the installation or part thereof falls below a certain point the relay drops its armature and the emergency lighting starts working.

The present invention has for its object to provide means whereby a forced control over the working condition of the emergency lighting is obtained each time the main installation is put into action.

According to my embodiment of this invention the bipolar switch is so designed that between its open and closed positions it must pass an intermediate position in which the emergency lamp or lamps, when in order, will light up whilst the control lamp or lamps will remain dark.

According to another embodiment of my invention I provide an iron core which under the action of its own weight, of a spring or any other suitable force will enter into a recess provided in the movable part of the bipolar switch when the latter passes or nears its intermediate position, the said core being withdrawn from the said recess against the action of the said force through the action of a solenoid, placed in the circuit of the emergency-lighting, as soon as

the current in the said circuit attains a certain predetermined value.

A further embodiment of my invention which is especially adapted for use in alternating current installations, consists therein, that the control lamp or lamps and the emergency lamp or lamps are combined to one single lamp for low voltage, say 4 volts, the said lamp being normally fed from the mains across a transformer. When however the voltage in the mains sinks below a certain value so that the relay will drop its armature the lamp is fed with direct current from a battery, a condenser preventing the direct current from flowing through the secondary of the said transformer.

In the accompanying drawings wherein an example of each of the said embodiments of my invention is illustrated;

Fig. 1 is a diagrammatic view of one form of the invention,

Fig. 2 is a diagrammatic view of another form thereof, and,

Fig. 3 is a diagrammatic view of a further modified form of the invention.

Referring to Figure 1 of the drawing 1 represents the main cables of a group or part of a lighting installation, controlled by a main switch 2. From these cables conductors are led to a bipolar plug contact 3, whence the current is supplied to a control lamp 5 and the coil 8 of a relay 9, these being connected up in series through one arm 6 of a bipolar switch, when the latter is closed. The armature 10 of the relay is movable in a vacuum tube 11, having in the bottom thereof two contacts 12, preferably mercury contacts which are in the circuit with an emergency lamp 16, supplied with current from a local battery 13 through the other arm 15 of the bipolar switch, when the latter is closed.

The bipolar switch may occupy three different positions,  $a a_1$ ,  $b b_1$ , and  $c c_1$  respectively. In position  $c c_1$  the relay and the emergency circuit are broken and both lamps 5 and 16 are dark.

It will be evident that in this position the emergency lighting is inoperative.

In position  $b b_1$  the right arm of the switch finds a "dead" contact  $b_1$  and remains inactive, whilst the left arm closes the circuit 13, 16, 15, 12, 13, the contact  $b$  being conductively connected with the contact  $a$ .

In position  $a a_1$ , the right arm of the switch engages the contact  $a_1$ , thus closing



the circuit 3, 5, 8, so that the lamp 5 lights up and the relay 9 is energized to attract its armature 10 thus breaking the circuit of the lamp 16.

When the tension on the coil 8 falls to zero or to a low value, either through accident or through the intentional opening of the group switch 2, the armature 10 of the relay 9 drops and bridges the contacts 12 whereupon the emergency lamp 16 is lit up. The disturbance in the main installation if any, being repaired, the emergency lamp is automatically darkened by the energizing of the relay 9. If, on the other hand, the lighting up of the lamp 16 was merely due to operating the switch 2, the bipolar switch is returned to its initial position  $c\ c_1$  until it is desired to put the main installation in action again, which is effected by bringing the bipolar switch from position  $c\ c_1$  to positions  $b\ b_1$  and  $a\ a_1$  successively, as described above.

If in position  $b\ b_1$  of the bipolar switch the lamp 16 does not light up this will indicate to the operator that the emergency lighting is disturbed and that it cannot be relied upon when a fault in the installation should occur. Of course the bipolar switch and the lamp 16 should be positioned in such a way with relation to each other, that the operator of the bipolar switch has the lamp 16 or a control-lamp parallel thereto right in view, so that, when the switch is brought into position  $b\ b_1$  the lighting or not lighting up of the lamp 16 will not remain unnoticed.

The diagram shown in Figure 2 only differs from that shown in Figure 1 in that a solenoid 14 is inserted in the circuit of the emergency lamp 16. The solenoid 14 acts on a loose iron core 17, which under the action of its own weight or of a spring, has a tendency to enter a recess 18 of the insulated cross-bar 19 of the bipolar switch, when the said recess passes underneath the said core. The bipolar switch then occupies its intermediate position  $b\ b_1$ , in which the emergency lamp 16 will light up when everything is in order. If so the ampere-windings of the solenoid 14 will be sufficient to withdraw the core 17 from the recess 18, whereupon the bipolar switch may be brought to its working position  $a\ a_1$ . If on the contrary no current or a current of insufficient strength flows through the emergency-circuit and consequently through the solenoid 14 the latter will leave its core 17 unattracted and the bipolar switch will remain locked in its intermediate position  $b\ b_1$ .

Figure 3 shows an arrangement in which the control lamp or lamps and the emergency lamp or lamps are combined into one single lamp of low voltage, say 4 volts.

The arrangement is especially adapted for

use in alternating current installations, since then the normal voltage between the mains may be reduced by a small and cheap transformer, which in Figure 3 is indicated at 20. The secondary of transformer 20 is connected to a plug contact 3. Of the two conductors deriving from the said plug contact 3 one is connected across a condenser 21 and coil 8 of the relay 9 to the working contact  $a_1$  of the bipolar switch, the other conductor being connected to the emergency circuit at a point between the solenoid 14 and the battery 13. A further essential difference with the formerly described arrangements is the fact, that the two contact levers 15 and 6 of the bipolar switch are conductively interconnected.

In the position shown with the bipolar switch occupying its rest-position  $c\ c_1$ , no current whatever will pass and the lamp 5 remains dark. When the bipolar switch is brought to the position  $b\ b_1$ , a direct current passes from the battery 13 through the contacts 12, armature 10, contacts  $a$  and  $b$ , arm 15, conductor 22, lamp 5, solenoid 14, back to the battery 13. If the battery is sufficiently loaded and the emergency circuits, described above, in order, the current therein will be sufficiently strong in order that the core 17 of the solenoid 14 will be withdrawn from the recess 18 of the bar 19, into which it had previously fallen. The bipolar switch may then be brought into its normal working position  $a\ a_1$ .

In this position an alternating current deriving from the secondary of transformer 20 will flow from plug switch 3 through condenser 21, solenoid 8 of relay 9, contact  $a_1$ , arm 6, lamp 5, solenoid 14 and back to plug switch 3. The relay 9 is energized and breaks the emergency circuit at 10, 12. It will be understood, that the secondary voltage of the transformer 20 must be substantially equal to the voltage of the battery 13, say for instance 4 volts.

When the voltage of the transformer falls to zero or approximately so, the armature 10 drops and the lamp 5, fed by the battery 13, will light up again. In order to prevent the battery 13 from being short circuited in this position by the secondary of the transformer 20, a condenser, such as 21, is inserted at a convenient place in the circuit which is exclusively destined for the alternating current.

What I claim is:

1. In an emergency lighting installation, a main circuit, an emergency circuit, circuit controlling means operating to close the emergency circuit in advance of the closure of the main circuit, and means responsive to the electrical energization of the main circuit to automatically open the emergency circuit.

2. In an emergency lighting installation,



a main circuit, an emergency circuit, circuit controlling means operating to close the emergency circuit in advance of the closure of the main circuit, and means responsive to the electrical energization of the main circuit to automatically open the emergency circuit, the last mentioned means forming part of the emergency circuit.

3. In an emergency installation, a main circuit, an emergency circuit, circuit controlling means operating to close the emergency circuit in advance of the closure of the main circuit, and means responsive to a predetermined degree of the electrical energization of the main circuit to automatically open the emergency circuit, said means including an electromagnetic device and a displaceable armature associated therewith constituting part of the emergency conducting circuit.

4. In an emergency lighting installation, a main circuit, a circuit control interposed in said main circuit, an emergency circuit, a circuit control in the emergency circuit, means connecting the first and second mentioned controlling means whereby the emergency circuit is closed in advance of the main circuit, and means responsive to a predetermined degree of electrical energization of the main circuit to automatically open the emergency circuit.

5. In an emergency lighting installation, a main circuit, a circuit control interposed in said main circuit, an emergency circuit, a circuit control in the emergency circuit, means connecting the first and second mentioned controlling means whereby the emergency circuit is closed in advance of the main circuit, means responsive to a predetermined degree of electrical energization of the main circuit to automatically open the emergency circuit, and means to lock certain of the circuit controlling means in circuit closing position.

6. In an emergency lighting installation, a main circuit, a circuit control interposed in said main circuit, an emergency circuit, a circuit control in the emergency circuit, means connecting the first and second mentioned controlling means whereby the emergency circuit is closed in advance of the main circuit, means responsive to a predetermined degree of electrical energization of the main circuit to automatically open the emergency circuit, means to lock certain of the circuit controlling means in circuit closing position, and electromagnetic means to release the locking means.

7. In an emergency lighting installation, a main circuit, a circuit control interposed in said main circuit, an emergency circuit, a circuit control in the emergency circuit,

means connecting the first and second mentioned controlling means whereby the emergency circuit is closed in advance of the main circuit, means responsive to a predetermined degree of electrical energization of the main circuit to automatically open the emergency circuit, means to lock certain of the circuit controlling means in circuit closing position, and electro-magnetic means interposed in and controlled by the emergency circuit to automatically release the locking means.

8. In an emergency lighting installation, a main circuit, an emergency circuit, a bipolar switch movable to a position intermediate its on and off positions and operating to close the emergency circuit in advance of the closure of the main circuit, an electromagnetic locking means associated with the switch and operating to lock the latter until the current of the emergency circuit attains a predetermined value.

9. In an emergency lighting installation, a main circuit, an emergency circuit, a bipolar switch associated with the main and emergency circuits, and electro-magnetic locking means associated with the bipolar switch and operating to lock the latter until the current of the emergency circuit attains a predetermined value.

10. In an emergency lighting installation, a feed circuit for alternating current, a transformer interposed in the main circuit, a main lighting circuit including the secondary winding of the transformer, an emergency circuit, a bipolar switch movable to a position intermediate its on and off positions and operating to close the emergency circuit in advance of the closure of the main circuit, and electro-magnetically controlled means operating to lock the switch in a predetermined position until the current of the emergency circuit attains a predetermined strength.

11. In an emergency lighting installation, a main circuit, an emergency circuit, a bipolar switch movable to a position intermediate its on and off positions and operating to close the emergency circuit in advance of the closure of the main circuit, and electro-magnetic locking means to lock the bipolar switch in its intermediate position until the current of the emergency circuit attains a predetermined value.

In testimony whereof I affix my signature in the presence of two witnesses.

PIETER DAS.

Witnesses:

ANTON DE NAGTEGNAEZ,  
CHRISTIAN VAN TUGELN.